

THE BOTTOM SHELF, INC.

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LIBRARY 100

LEVEL II TRS-80 SOFTWARE
(100 PROGRAMS)

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Dear Friends:

Thank you for purchasing the Library 100. We hope you will enjoy our programming.

The Library 100 was designed with you in mind. It is terrible to own a \$700 to \$4,000 computer and have it sitting idle because it isn't programmed to be useful. The Library 100 was created to fill this need.

While TBS Inc. will be providing other software in the future and continuing the volume sales pricing method we felt it was imperative to provide you with a basic software library as soon as possible. Our business is serving you. As you notice, we said a basic software library. The Library 100 is not intended to meet all of your software needs. Instead it is intended as an introduction into the excitement of computers. We hope you will get many ideas for future uses for the computer from the Library 100.

The Library 100 will not be offered in Level 1 Basic. We did not feel we could provide you with an adequate level of quality considering the limitations of the level 1 language.

Much of our planned future software will require at least one disk unit and 32K of memory (1 print modes will be available). We hope to lead the field in providing applications software for the TRS-80.

We are currently involved in Semi-Custom Software manufacture. By Semi-Custom Software we mean that we are doing individual applications programming. But only when we see a national market for the software. Consistent with our policy of giving the customer the best possible bargain, we are giving the original applications software purchaser a limited 10 percent royalty on the software we develop for him and market nationally. Consistent with our policy of quality, we will not accept projects we feel we cannot properly do on the TRS-80 or ones that we feel are not consistent with the highest programming standards.

Once again we Thank You for your purchase and hope you enjoy using the Library 100 as much as we enjoyed creating it for you.

Sincerely

THE BOTTOM SHELF, INC.

Officers & Staff

TAPE #1

Business and Finance

Side 1-A (16K)

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7	431	Sale-Cost-Martin-Day of Week	U
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12	79	Multiply/Divide	C
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13	134	Base Numbers	E
9 -12	156	Eduquiz (16K)	F
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TAPE #3

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20	51	Wierd	B
20	65	Ratrace	C
20	78	Random Ad	D
19	96	Fireside	E
19	109	Left Right	F
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21	141	Herring	H
21	152	Launch	I
21	166	Blinker	J
21	177	Snoopy	K
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21	213	Step Ad	M
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--	252	War Game *GAME*	P
31-34	286	Star Trek	Q
37	377	Speedy	R
36	392	Life	S
37	411	Count	T
37	431	Road Race	U
36	448	Fifteen	V

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27	85	Nutrition	B
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28	189	Calendar	D
23	210	Base Conversion	E
22	225	Calculator	F
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	63	Search	S
	97	Memory Letters	M
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	231	Decision	D
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	522	Mind Reader	M
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	547	Jumble 2	J
	567	Gypsy	G

BUSINESS & FINANCE

As with any series or system of business or finance programs, do not rely on any of the following programs until they have proved accurate in your particular application. This can only be done by running them in parallel with your operation for a length of time sufficient to show the accuracy of each operation contained in the program. There are a number of items which may make the following programs show slightly different results from your current methods, or methods used by others upon which you rely. For instance all programs contained in the LIBRARY 100 use an interest rate based on 365 days per year; most banks will figure interest on a 360 day year. Further, several of the programs in the LIBRARY 100 use fractional cents as payments on installment loans, when, in fact, these fractional cents, of course, cannot be made in practice. This is of particular concern in amortization schedules, and the very last payment is often used as an "adjusting" payment. The figures for the bond programs may not match exactly what you see in your daily newspaper, as those results are calculated using various conventions which in themselves produce inaccuracies. All programs, except the Real Estate Capital Investment Program, use single precision variables, and thus will be accurate to a maximum of six (6) significant digits. This was done in the interest of speed of operation, as six (6) significant digits suffice for almost all of the uses to which these programs should be put. Again, use these programs in parallel with your existing methods until they appear to be sufficiently accurate for your use.

For you 16K folks, finance programs are menued on Side A of tape number 1. For you 4K folks, the finance programs are broken down into individual programs on Side B.

In most of the financial programs sufficient instructions exist to both explain the program and request the proper data to be entered. Carefully read the question asked, and answer it exactly as instructed. For instance, in Program Number One, of the first Finance Program, which calculates the Present Value of a Future Sum, you are requested to state the future sum in dollars.

Do not enter a dollar sign, merely the number. The same goes for the second question which asks for the annual interest rate in %. Please note that you are asked for the annual interest rate, not the interest rate for any one particular interest period. The next question asks you to enter the number of periods in one year. This would be the number of interest periods, normally monthly, which would be twelve periods in one year. The last question necessary for computation is the total number of periods to be calculated. This must be the number of periods, for instance a loan to be compounded monthly for ten years, the number of periods would be 120.

For a few of the problems, the parameters are restricted somewhat. For instance, in the amortization schedule (Program 4 of the first finance menu) the compounding rate of the loan must be in months, as is indicated in the request for information.

In a few programs, such as the Interest Rate-Compound Interest or Days Between Dates, you are asked for a formatted entry on a date (month, day, year). The format is given, and should be followed exactly. Do not forget commas. Commas are required.

The largest program in the first section is Number 10, the Real Estate Capital Investment Analysis. A great deal of information is needed for completion of this program, which should be obtainable from your broker, seller, or accountant. The information needed is as follows:

- 1) Purchase price of property
- 2) Vacancy allowance, in %
- 3) Number of units in the property
- 4) Square feet of usable space in property
- 5) Anticipated gross income
- 6) Expected expense ratio (expenses/actual income) in %
- 7) The term of each mortgage, in months
- 8) The annual interest rate of each mortgage, in %
- 9) Depreciation allocation to building, in %
- 10) Depreciation allocation to personal property, in %
- 11) Method of depreciation for building
- 12) Term of building depreciation for building, in years
- 13) Method of depreciation for personal property
- 14) Term of depreciation for personal property, in years

Finance Two

1) The nominal interest rate is the rate usually quoted by financial institutions for loans, and is only correct if the loan is paid back at the end of the first payment period. If the loan is continued for a period of one year, the interest due at the end of each period is added to the principal and compounded, and interest is charged on that interest, this raises the effective interest rate at the end of the one year period. For instance, (work through this one) a future value of \$119.56, a present value of \$100.00, a total number of periods of 12, at twelve (12) periods per year, gives you a computed nominal rate of 17.9986%, and an effective rate of 19.56%. This is the standard 18% per year (revolving charge) type account carried by many department stores. The difference between the nominal rate shown by the computer and the 18% is due to the fact that a computed future value at exactly 18% is about \$119.563. We ignored the fractional cent. This program is useful in figuring the interest on your credit cards.

2) Internal rate of return. This program figures the present value of the sales price of an earning investment and the present value of these earnings of that investment, subtracts the purchase price of the investment. The rate of return is returned by the computer in percent (%), and the effect of your investment may be easily measured against the return on a more standard investment, or against your standards. This type program is used commonly in business to determine whether a particular investment should be made.

3 & 4) These programs are the corollary of the loan programs used in Finance One. A deposit is known as an annuity due, where the payment is made at the beginning of the earning period, such as deposits in a bank account. A regular annuity has payments at the end of the earning period, such as a loan from a bank. Be sure you get the proper program for your use.

5, 6, 7 & 8) Compute various methods of depreciation for you. In Program 8, a depreciation factor is called for and described within the program instructions. If you don't know what the other depreciation methods are, you probably want straight-line depreciation. Prior to using the other methods, an accountant's advice is called for.

9) This program determines the present value of a coupon bond, according to your desired interest rate, and returns the present value which will produce that particular interest rate.

10) Program 10 performs the converse of Program 9, and will determine the current yield to maturity, at a given price, returned on the screen in %, given a particular purchase price of a bond.

FINANCE THREE

Consists of five programs, the first three of which are closely related for merchants and others desiring repetitive use of a sale-cost-margin programs. These are set up for repetitive use, so that large numbers of items may be calculated simply. The fourth program gives you the day of the week for any date (Gregorian). The date format is required as indicated, including using all digits for the year, i.e., December 7, 1941 is: 12,7,1941. Don't forget the commas!

MOVING ADVERTISEMENT

The moving advertisement package is designed to maximize the graphic capabilities of the TRS-80 and allow you to have an intriguing television billboard. Radio Shack dealers take note.

This program allows you to enter ten static (non-moving) advertisements and ten moving advertisements into your computer and store them on tape. There are ten sections to this program in the 16K version. Once you have designed and entered your group of messages the computer will display randomly two moving and two static (non-moving) advertisements on the screen. The messages will be resident on the screen for three cycles of the longest of the two moving adds being used at that time at which time the computer will select two more static advertisements and two more moving advertisements. This program will be of major use to computer owners that have businesses with large amounts of walk-in traffic.

IMPORTANT--You must enter at least two static (non-moving) and two moving advertisements.

When you run this program the first question that will be asked is whether the program was loaded from disk. Answer this questions with yes or no. After you enter your answer a menu will appear on the screen. Number one is make "entries to the file-static." This subprogram allows you to enter messages that are of a non-moving type. Your message should be no more than five lines in length. Be sure to format your message so that it looks right on the screen. Do not hit enter until you have completed the message. The cursor is positioned at the far left side of the screen. Start entering your message until you have completed what looks right on the first line. Then space to the beginning of the next line. Do not hit enter. You may then continue your message. When the message looks right on the screen it will be correct for you to enter it into the file.

The second subcategory is make "entries to the file-moving." When entering your messages to the moving ad section, continue typing until your message is completed. Do not worry about the format on the screen, and do not hit enter until you have completed your message.

Subcategory three is "record entries." This subprogram will ask you to place a blank tape in the recorder and the recorder in the record mode. Be sure this is completed before pressing enter. Record the entries you have made in the other files to tape.

"Load entries." This subprogram will allow you to load your previous tapes containing the data for your moving and static adds. The subprogram will ask you to place your data tape in the recorder and the recorder in the play mode. Do not press enter until these steps are accomplished.

"Edit entries-static," and "edit entries-moving." You may edit existing records by entering the edit mode. The program will display your previous entries and allow you to make corrections. When you make a correction you must correct the entire entry. If you type anything, it will replace the entire message. In order to exit the edit mode, you must press enter until the program leaves the edit mode. You may not leave the edit function by entering a shift Z as you were able to do in making entries to the file.

"Add static entries" and "add moving entries." These subprograms will allow you to enter additional entries to the file. Each time you make an additional entry you must go back into the add mode that you wish to use. The subprogram will allow you to enter one entry and then will return you to the menu. This function is extremely useful in that you can load a previous data tape then add another entry. For instance, today's special sale.

"Display Add." This function allows you to display your advertisements. Merely press 9, then press enter and the files you have already constructed will be used for your advertisement. If at any time you wish to return to the menu, press Shift Z; and you will be returned to the moving advertisement function menu.

EDUCATION

The Bottom Shelf, Inc. has taken the approach to education of attempting to make learning as natural and as much fun as possible. To accomplish this we have incorporated what we consider to be a high degree of flexibility into our programming.

SUBJECT PROGRAMMING - EDUQUIZ SECTION

The eduquiz section is a group of ten interactive programs which allow the operator to choose from one of ten subjects and then on any of the ten subjects perform a drill, a multiple choice examination, a true-false examination, a matching examination or a fill-in-the-blank examination. The subjects are (1) states and capitals (2) states and date of entry to the union (3) states and order of entry to the union (4) states and abbreviation (5) states and largest city (6) inventors and inventions (7) world capitals and country (8) urban areas and their population rank (source - World Almanac) (9) authors and their books (10) Presidents and their rank order. All ten subjects are displayed on the screen. The operator has the choice of selecting one of the ten subjects by entering the number to the left of the subject. The programs then give a second menu indicating at the top the subject, for instance, states and capitals and gives the operator six choices (1) drill (2) multiple choice (3) true-false (4) matching (5) fill-in-the-blank (6) return to subject menu. The operator then selects the number of his choice.

Drill

The drill routine proceeds down the file first displaying the information then asking a question about the information with the information displayed. A sample is: Alabama's capital is Montgomery. The question is, "Montgomery is the capital of ..." The operator then types in "Alabama" and presses enter. The drill will not proceed until the right answer is entered or optionally you may type help which will end the drill. The information is then wiped off the screen and another question is asked. In this case "Alabama's capital is ...", the operator is required to type in "Montgomery". The program will then say right and proceed to the next question or wrong and return to the previous question. The drill routine is useful in learning the information in the first place, whereas, the other quizzes are primarily useful in testing and supplementary learning on a subject. In order to exit from the drill the operator must either go through the entire subject data file or type help. At the completion of the drill the operator's score will be given in numbers right and numbers wrong. The program will then go to another

menu giving the operator the option of redoing the drill, returning to the quiz menu and selecting another quiz mechanism on the same subject or returning to the subject menu.

MULTIPLE CHOICE

When the multiple choice option is selected the programmer will first prompt, "How many questions do you want?" As the multiple choice section will not give you the same question twice. The program will not allow you to enter a number of questions larger than the total amount of information in the data file on that subject. If you do ask for too many questions it will ask you again, "How many questions do you want?" Once you have selected how many questions you desire the program will ask you whether you want questions on one of the two related categories or random questions. For example, if you chose the subject states and capitals you would have the selection of questions on states, on capitals or random. A sample question of states would be, "Baton Rouge is the capital of ...?" An example of capitals would be, "Nebraska's capital is ...?" Random would randomly select the patterns asking some questions, asking for the states and some questions asking for the capitals.

During the multiple choice examination you may discontinue by typing in eleven. This will allow you to exit from the multiple choice examination. At the completion of the multiple choice examination your score will be given in numbers of answers right and numbers wrong and a menu to choose from which allows you to redo the previous quiz, return to the quiz menu or return to the subject menu.

TRUE-FALSE

After selecting a true-false quiz you will be asked the number of questions that you desire. The true-false quiz will randomly make statements such as, "Nashville is the capital of Kentucky" or "Kentucky's capital is Frankfort". You are required to enter 1 for true or 2 for false. The computer will immediately tell you whether you are right or wrong. Upon completion of the test the computer will automatically exit the true-false mode and tell you how many answers you got right and how many answers you got wrong and give you the options of redoing the previous quiz, returning to the quiz menu or returning to the subject menu.

MATCHING

If you select the matching quiz the program will randomly select items from each of the two associated cate-

gories, i.e. states and capitals, and place them in random order in two columns'. The computer will then prompt you to select a number from one of the categories, i.e. enter the number of your choice from the category states. You then have the choice of any of the ten subjects in that category. The computer will then prompt you and ask you to enter the number of your choice from the second category, i.e. from the category capitals. If you wish to change your entry for the first category merely press enter on the second category. The screen will then be reformatted and you will be asked to enter your choice from the first category. Upon making a selection the program will first tell you whether you are right or wrong and show you the right combination. The screen will then be reformatted with your choice from the first category absent and the subject that matches your first choice absent. At any point you can exit the matching quiz by entering eleven as the number of your choice from either category. Upon completion of the quiz, either by entering eleven or by doing all of the problems, you will be given your score and the choice of redoing the previous quiz, returning to the quiz menu or returning to the subject menu.

FILL-IN-THE-BLANK

Warning. This is the most difficult of all the quiz mechanisms. Do not use the fill-in-the-blank until you know the topic well. This will help avoid lost pride. The fill-in-the-blank section will first ask you a question. You must fill in the answer using exact spelling. If you miss the question, you will be given the right answer, told you are wrong and be required to fill out the right answer. The program will not proceed until the right answer is entered. At any point you can exit the fill-in-the-blank quiz by typing help. Upon completion of the fill-in-the-blank, either by typing help or completing the number of problems you originally specified, you will be given the number of answers you got right, the number of answers you got wrong and the choice of redoing the previous quiz, returning to the quiz menu or returning to the subject menu.

All the problems in the Eduquiz section are done by random selection. You will not get the same questions in the same order on any of the quizzes except the drill.

ADDITION

The addition program is designed for almost all skill levels. You are first asked to enter your name and your level from 1 to 10, 1 being a low level and 10 being the highest. All the questions in the addition

quiz are randomly selected. Entries are taken from right to left just as you would add up a column of figures using a pencil and paper. This is in reverse of the way you would normally enter figures into a calculator or computer. In order to make corrections on what you enter press the arrow which points "to the right" on your keyboard. When you have entered your answer the program will evaluate your answer and tell you immediately if you are right or wrong. If you are right a star will appear on the right side every time you complete a correct entry. If you are wrong the program will tell you that you are wrong and tell you what the right answer was. At the completion of ten problems the program will tell you how many you got right and how many you got wrong, then give you the options of playing another game at the same level, playing another game at another level or letting a new player play the game. Warning. The higher levels of addition are extremely difficult. You may get problems with as many as ten four-digit numbers.

SUBTRACTION

Subtraction is similar to the addition program with the exception that it quizzes you on subtraction instead of addition.

MULTIPLICATION AND DIVISION

This program drills a person on the multiplication and division tables up to twelve. You have the choice of doing either multiplication or division and the choice of one of five levels of difficulty. The multiplication drill will give you multiplication problems five to a screen, two screens worth for a total of ten problems. It will then give you your score. After each problem it will tell you whether you are right or wrong and if you are wrong what the correct answer was. If you are right it will place a star on the right side of the screen. At the completion of the program you will be told what your score was. Division uses a formatted screen, giving you one problem at a time on the screen. All problems will require only an even number entry. If you get the problem right you will be told that you are right and a star will appear on the right side of the screen. If you get it wrong you will be told that you are wrong and what the correct answer was.

FRACTIONS

This program will quiz you on either the conversion of fractions to decimals or of the conversion of decimals to fractions. The program has four levels of expertise,

beginner, average, good or great. After choosing your level you have a choice of converting fractions to decimals or converting decimals to fractions. On converting fractions to decimals, the fractions should be rounded to three places, i.e. $2/3 = .667$.

If you get a problem wrong it will tell you that you are wrong and give you the correct answer. If you are right it will tell you that you are right and give you a star on the right hand side of the display. On completion of ten problems it will tell you how many right and how many wrong you got. On converting decimals to fractions you will be given a decimal number and be asked to enter the fraction on a formatted screen. If you get your answer right it will tell you that you are right and give you a star on the right hand side of the screen, if you are wrong it will tell you that you are wrong and give you the correct answer. At the completion of ten problems it will tell you how many you got right and how many you got wrong.

BASENUM

The Basenum program is designed to give you training in the art of conversion of numbers from one base to another. The program is extremely flexible and allows you to have questions asked in any base or give the answers in any base. The program will first ask you what base you want the problems in. You have a choice of bases from 2 to 32. The program will then ask you what number base you want to use for the answers. The program will then ask you what level you wish to choose. You have the choice of Level 1, which is up to the decimal number 10. Level 2, which is up to the decimal number 100, Level 3 which is up to the decimal number 500, Level 4 which is up to the decimal number 1000, or Level 5 which is up to the decimal number 64,000. Once you have entered your choice of levels, the program will give you ten random problems in the number base you chose, using numbers which are equivlant in decimal, too, up to the highest number in the level you chose. You are expected to respond with answers in the number base that you originally chose. After you have completed ten problems the program will give you your score.

Tiny PILOT

Education through the use of computers is now a "fact of life". Computers affect our day to day lives in so many ways that it is only logical that they be put to use in the education field, not only for educating people in the uses of computers, but educating people with computers. Out of the need for CAI, Computer Aided Instruction, a nontechnical, noncomputer specialist language was required, thus "PILOT" was born. This is short for Programmed Inquiry, Learning Or Teaching. Several PILOTs have been written, but before the advent of inexpensive microprocessors these were only available to the large educational institutions with the finances to afford a mainframe machine to run these PILOT programs. Now, for the first time, computers are available to a wide group of people for commercial and personal use. CAI can be brought into the home, the place where education begins.

The Bottom Shelf, recognizing the need for a PILOT home use, and utilizing the TRS-80, a powerful, well-proven and inexpensive microprocessor, has developed Tiny PILOT (TPILOT). This PILOT is an interpretive language, that is, TPILOT is a machine code program that interprets PILOT command statements and performs some action based on the command. There are a total of ten TPILOT commands available, but it only requires three "core" commands to write a PILOT program. These are commands that are straight forward and easy to use. By reading the instruction outline and studying the sample programs provided, a child can be programming PILOTs within a matter of minutes. The three core commands are:

T:for type a text line
A:for accept answer from the keyboard
M:for match data string with answer previously typed in

Also, the command E:is used to terminate the program.

An example of the simple PILOT program would be as follows:

T:What is the capital of France?
A:
M:Paris
TY:Right
TN:Wrong
E:↑

"A":accepts the answer the user keys in.

"M":matches the known answer against what was entered.

"TY":causes the following text to be displayed only if there is a match.

"TN":causes the following statement to be displayed only if there is not a match.

Other commands are added to provide flexibility in programming, such as the counter commands which may be used to construct program controlled "loops" or answer "scoring" functions.

Two versions are offered for the TRS-80 Level II, a 4K and 16K version. The only differences between the two are memory capacities. The 4K version will handle 5 labels and 24 64-byte statements; the 16K version handles 100 labels and 200 64-byte statements.

See page 2/4 of the Level II Manual for instructions on loading under the SYSTEM command. Use the title TPILOT to start the loading procedure.

Upon loading TPILOT through the SYSTEM command, the user is given the option of either keying in the PILOT command statements or loading a previously stored program from a cassette. On termination, the user may save the PILOT program on cassette if he desires. At the present time a text editor is not available for TPILOT, but one is being developed by The Bottom Shelf and will be released shortly.

Tiny PILOT is only the beginning of our efforts in the PILOT field. Future editors will have many "bells and whistles" added. However, the current program will provide you functional programs without a major effort to "learn a new language". All efforts will be made to make future PILOTS compatible so that the programs you make now will run as the expanded versions. Send us comments on enhancements you would like to see.

SAMPLE TINY PILOT PROGRAMS

#1 T:What is the capital of France?

A:

M:Paris

TY:Right

TN:Wrong

E:[↑] ..

#2 T:Enter a vowel

A:
M:A, E, I, O, U
TY:Correct
TN:Incorrect
E:
#3 T:The next command statement
T:Will clear the screen
C:
T:This statement will appear on line 1
E:
#4 T:We will now perform a "jump" command
J:@Here@
T:This statement will be bypassed
@Here@T:This is the next line to displayed
E:
#5 I:This is a comment statement. It is "I"gnored
Z:H
@Loop@T:This line will appear 16 times
B:H
X:H=016
C:
JN:@Loop@
E:
#6 Z:H
Z:I
T:Enter a vowel

QAskQA:

M:A, E, I, O, U

BY:H

B:I

X:I=005

TN:Name another

JN:QAskQ

X:H=005

TY:Good! 5 in a row!!

TN:Not too good. You didn't get all 5

E:

TPilot INSTRUCTION SUMMARY

COMMAND SYMBOL	NAME	FORMAT	
T	type	(@label@)T:	(text)
A	ask	"	A:
M	match	"	M: string 1, string 2, ... string n
J	jump	"	J: @label@
Z	zero counter	"	Z: [H,I,J,K]
B	bump counter	"	B: [H,I,J,K]
X	examine counter	"	X: [H,I,J,K] [=<>]x
C	clear screen	"	C:
I	ignore text	"	I: (comment text)
E	end	"	E: ↑

Legend

X	000 to 255 (must be 3 digits)
[]	choose on entry
()	optional
↑	up arrow key
@label@	1 to 6 alpha numeric characters
text	ASCII character string excluding "@" and ":"

GRAPHICS

This section is designed to show you the graphics capabilities of your TRS-80. While many of the programs are merely light and entertaining, the others may be used for advertisements. The main intent of this programming section is to put the TRS-80 through its graphic display-paces.

FRONT PAGE

Front Page is our advertisement. We hope it will talk you into telling your friends about our product. We have done our best to provide the best bargain in software history. For your friends sakes as well as ours, please advise them of the quality and quantity of our programming. Since its advertising, we didn't count it in the 100.

LEFT-RIGHT ADVERTISEMENT

This program will allow you to create a moving ad that moves across your screen from left to right. You will first be asked to enter a nonmoving advertisement and you will then be asked to enter a moving advertisement. The nonmoving advertisements can have multiple lines by your positioning the ad. The input is in the thirty-two character wide format and when you are completed with the first line, continue spacing the cursor until you line it up under the first letter of the first line. When your nonmoving message is displayed it will then have multiple lines which start at the left column. The nonmoving message can be up to 200 characters long. Do not worry about how it looks on the screen in input. Do not hit the enter key until you are completed with the message. The display will move a message from the left to the right. As it approaches the right side of the screen it will subtract characters to the left to place in the next word of the message.

BLOCKS

Blocks is a graphics display that draws a series of blocks on the screen. The blocks are randomly placed and random sized. When 25 blocks are placed on the screen, the screen will be cleared and process will be repeated.

FIRESIDE

Fireside will let the computer do its own thing. It will draw random designs on the screen from right to left, left to right, top to bottom, bottom to top, randomly clearing them out and randomly completing drawings.

Many of our customers have spent hours watching the display. It is truly unusual.

STEP AD TWO

Step ad two is another advertising program. It allows you to enter message of up to 250 characters in length and it will display the message in a stair step manner. At any point you can change the message by pressing (shift) Z. Do not be concerned about the format of the message as you enter it. Continue typing until the message is complete before pressing enter. This program takes your sentence, divides it into individual words, prints the word, drops down one line, then prints the next word. At the completion of the sentence the screen will advance forward and the stair step will begin on the left again. If the message is long enough to continue to the far right side of the screen the next word will appear on the left side of the screen.

RANDOM AD

This program will allow you to print a message on the screen. The message will be flashed on the screen one word at a time and in a random location on the screen. The screen is then cleared, pauses for a second and prints the next word in the message. At any point you can enter a new message by pressing (shift) Z. Do not press enter until completing your entire message. The message can be up to 250 characters in length.

WEIRD

Weird is a weird program. Call it up and watch it in operation. Random graphic characters randomly move across the screen. A graphic extravaganza, fun at parties or entertaining viewing when television is boring. Merely run the program and the program will do its own thing.

RAT RACE

Tired of the rat race? Computerize it. Rat race allows you to put a short message on the screen and combines advertisement and graphics. First, you enter your message (just press enter if you don't want a message) and the computer will do its version of a rat race. Up, down, back and forth. Which way will it go? A little star runs around the screen leaving periods behind it. Just when it has gone just about every place, the screen and it starts all over again.

GRAPHIC WORDS

Graphic words allows you to enter a message which it will then divide into individual letters which will move up the screen, moving inward from the two corners or outward from the center. Try it. You'll like it. The message can be up to 250 characters in length. Do not hit enter until the message is complete.

LAUNCH

Launch is another advertising mechanism. It allows you to enter a message which will be displayed on the screen one word at a time. Starting from left to right each letter in the word will be launched to the top of the screen. When the last letter is launched to the top of the screen, the next word will replace it and the process will be repeated until the end of the message. Messages should be limited to 255 characters.

RED BARON'S ENEMY

Red Baron's enemy draws our canine super hero in full battle gear as his dog house receives aerial hits. He issues his proclamation, "Curse you Red Baron." Regular and reverse video used.

BLINKER

Blinker is another advertising mechanism. It allows you to place one nonblinking message on the screen and one blinking message on the screen. Each message is limited to 250 characters in length.

HERRING

Herring draws an interesting pattern on the screen. Watch it in action. That's the only way to describe it.

SNOW

Snow allows you to enter a letter or character and watch it "snow" on the screen. The program will also accept full words such as; names, etc. However, it causes overlap and the program was designed for using one character entries.

STEP AD

Step ad is the last of the advertising mechanisms. It is a different mechanism for entering a stair message across the screen. The message is limited to 255 characters in length.

HOME SECTION

The home section was designed to provide some useful functions for the computer in the home environment.

It was particularly difficult to provide useful programming for our home environment without printer and disk units. Many functions such as the Christmas list, mileage, expense account, calculator and others would be greatly enhanced if programmed for a disk unit. However, these programs were designed for the TRS-80 Level II with some emphasis on 16K Memory and tape storage as most TRS-80 users do not have the additional peripherals yet.

DRUNKOMETER

The drunkometer, tests reaction time and averages the results of three reaction tests. These results are compared against the levels okay, so so, tipsy, high and drunk. Using a formatted screen, the program prompts you on your mark, get set and go. The time between the prompts is a random variable. The reaction time is then "metered". When you complete three reaction tests the results are averaged and your reactions applied against the scale.

This test is not to be considered a valid test of alcoholic consumption level; however, if you score poorly on the drunkometer it would be adviseable to have a friend do the driving.

NIGHT CHECK-OFF LIST

The night check-off list uses a formatted screen in order to prompt you, or the children, in preparation for retiring each evening. When you press the number of the item being checked off it will be erased from the screen. Pressing invalid keys or pressing the key for an item already checked off will result in a message indicating that you should try the right keys. Upon completion of the check-off list, the program automatically terminates and prompts you to turn off the computer for the evening.

VACATION CHECK-OFF LIST

The vacation check-off list uses a formatted screen to aid you in preparation for departure on a vacation. Once you complete an item press the key corresponding to that item, the item will then be deleted from the screen. Pressing inappropriate keys or pressing the key for an item already checked off will result in a message indicating that the key used was improper. Upon completion of the check-off list the computer

BABY SITTER

The baby sitter program allows you to post instructions for your baby sitter, save them on tape, load them back in, make corrections or make additions to them. The program provides one screen of emergency numbers and on the next screen provides special instructions which you create. At the bottom of each screen the baby sitter is instructed to either press any key for notes or press any key for instructions for emergency numbers. The screens will change when any key is pressed. You have the option of making alterations to the instructions by using the edit mode or displaying your instructions and returning to the menu by pressing shift Z. You will then be returned to the menu. The menu consists of enter entries to the file, edit entries, record entries, load entries and display. The program prompts you through entering the name of the family physician, his telephone number, the name of a relative, the relative's relationship, the relative's phone number, the name of a neighbor, the neighbor's phone number, phone number of the fire department, the phone number of the police department and the phone number of the ambulance service. It then asks you to enter the number of your rule and then the rule or note. Continuations of a rule or note can be made by not entering a rule number. By using the edit mode you can change the telephone numbers or the titles of the telephone numbers. For instance, you can change the title and phone number for ambulance service to the title for the poison control center and its phone number. The program can best be used by creating a tape entry which would have the telephone numbers and a few specific rules or notes. You can then enter the edit mode and add your evenings itinerary and a phone number where you may be reached.

CALCULATOR

Calculator allows you to use your computer as a calculator. You have eleven functions available to you: add, subtract, multiply, divide, change signs, memory, clear and replace with value, memory plus total; memory plus value, recall memory to value, clear memory and percent. The program asks you to enter your initial value, it then asks for your function. If your function needs a second value it asks you for the second value. For instance, the problem $23 \times 46 = ?$ would ask you to enter the initial value, enter the function and enter the second value. The functions are resident on the screen at all times and upon completion of a function the total of your previous operation is carried to the initial value so that you can do long calculations easily.

prompts you to secure and turn off the computer.

EXPENSE ACCOUNT

Expense account is a great aid to executives or salesmen who must fill out expense accounts. The program starts on Sunday and prompts you through entries for fares, lodging, breakfast, lunch, dinner, entertainment, other tips, tolls, local transportation, telephone and communications, other expenses, gas, wash or mileage and storage. It then gives you the total for each day. At the end of the week it sums up the totals for each category and gives you a total expenditure for the week.

MESSAGE BOARD

The message board allows you to use your computer as an attention getting message board. No longer will members of your family be able to say they did not get the message or did not find the note when the message board program is used. The message board program first asks you for the name of the person to whom the message is directed. It then asks for the message. It then asks if there is a second message and repeats the process. The names will appear in the upper left hand corner and the middle of the screen. Depending upon what you enter below the names, one or two messages will appear. The messages will move across the screen in a 32 character wide format and in a manner similar to a Time Square moving lights billboard. In order to change any message all you have to do is press any key on the board, a menu will then appear from which you can select to change the first message, change the second message, return to the present message or change both messages. If you elect not to make changes, select choice number three and the previous messages will re-appear.

TELECODE

Telecode is a program that allows you to find words that are associated with your telephone number, friends telephone numbers or special numbers that you want to remember. The numbers two through nine on your telephone have three letters assigned to each of them. This program will randomly place one of the three letters associated with your telephone number while maintaining your telephone number sequence. By entering the telephone number and watching the screen you will probably find some words that are associated with the numbers. After entering your telephone number you can press any key to pause the display. You then have the choice of continuing by pressing enter or entering a new telephone number by pressing S then enter.

CHRISTMAS LIST

The Christmas card list is a versatile program that allows you to create a name and address file. The program was designed primarily for Christmas cards but can be used for other functions as well. The program starts by giving you a menu allowing you to read a tape, write a tape, enter or edit the file, search a file for a specific entry, display a file or sort a file. To enter or edit a record you press the corresponding key to enter/edit and you are then prompted asking whether you want to edit an existing file or make a new entry to the file. If you choose to enter records, you will receive a formatted screen stating last name, first name, street address, city, state, zip code, phone number, comments and miscellaneous. At the base of the screen you will be prompted into making your entries. When you press enter the entry will appear in the proper position on the formatted screen. If you choose to go into the edit mode you will be asked which record number you want to edit and editing will start at that point. You will be prompted, using the same type of formatted screen, into making corrections only in a section which you wish to alter. For instance, if the last name is Jones in the edited record you will see at the base of the screen the prior entry item. If you press the @ sign key the old record will remain and you will be prompted on the next item, however, you may make an entry by typing in a new last name, for instance, Smith and pressing the enter key. This will substitute Smith for Jones. Upon completing an entry you are given the option of canceling the entire entry by pressing the clear button or recording the data by pressing the enter button. You will then be prompted that if there are no more entries press the up arrow and you will exit the enter/edit mode and return to the menu. The search file mode will give you all the categories: last name, first name, street address, city, state, zip code, phone, comments and miscellaneous and ask you which category you wish to use. It will ask you for the item sought, for instance, you might search for the last name of Jones, it will then give you the item numbers which match with Jones. You can then enter the record number and get a complete display of that file. Display file asks you whether you wish to display starting at what record. If you don't choose a specific record it will start at record number one. It will then display the name, last name first, and the comments field for a series of ten entries. You then have the capability of paging forward or back, returning to the menu or displaying a specific record. To display a specific record choose its record number, press the appropriate keys and press enter. The record will then be displayed. You can then either press enter to page to the next record, press the @ key

to return to the file display or press the clear button to return to the menu. Sort. This subprogram will also allow you to sort the file by any one of nine categories. You first press the key for sort. It will then ask you to choose what category: last name, first name, street address, city, state, zip code, phone number, comments or miscellaneous. All you have to do is choose the category and the sort will proceed. Upon completion of the sort it will return you to the menu. At that point your file is reorganized and renumbered in ascending sequence for that category.

MILEAGE

Mileage allows you to keep track of your automobile gasoline costs. It first allows you to enter data that you have previously entered from tape then allows you to either make entries from the keyboard or to get the results of the previous data. If you select to enter your information it will ask you to first label the trip, for instance, vacation trip 1977. It will then ask you your starting mileage and ending mileage. It will not accept mileages equal to each other or an ending mileage that is less than the starting mileage. It will then ask you the number of gallons used and the total cost. You can have repeated entries under any specific label. So you can use this as either a mechanism to determine your costs on a specific trip or maintain a running log on your automobiles. When you are finished entering it will display each entry in your file with its label in the sequence that you have entered it. For each entry it will give the period, miles, gallons used, cost, miles per gallon, cost per mile and the cost per gallon. You can then press the total key and get a summary of all costs giving the grand total for all periods. You then have the option of selecting to review your previous figures, add more entries or write the data to tape. This program is ideal for the multiple car families because they can keep separate tape logs for each car or label and combine them. The program is limited to 50 name files.

REMEMBER

This program will aide members of the family in learning important telephone numbers and information. You can create your own data file of the family physician, his telephone number, a relative, relationship, phone number, neighbor, his phone number, fire department, police department, ambulance, etc. Then record these entries or load previous entries. The program will then give the operator a randomly selected fill-in-the-blank test on the items entered into the data file. While the program prompts you into entering for a

specific emergency number you can use this program to create tests on almost any subject. You can do this by using the edit entries mode. It will allow you to enter whatever information you want to have members of the family tested on.

NUTRITION

The nutrition program allows you to select various types of foods and the portion you will use. It then will give you the calories and carbohydrates for the foods you selected and keep a running total of previous selections until you decide to discontinue the total. The program contains eleven food categories: (1) milk, cream and cheese (2) eggs (3) meat and poultry (4) fish (5) nuts (6) vegetables (7) fruits and fruit products (8) grain products (9) fats and oils (10) sugars and sweets (11) miscellaneous. Within each category there are many types of foods to choose from. This program is a valuable tool to selecting nutritious meals.

CONVERSION

Conversion allows you the capability to make conversions from one unit of measure to another in the fields of (1) length, (2) area, (3) volume, (4) weight avoirdupois, (5) weight troy, (6) weight apothecaries, (7) capacity liquid, (8) capacity dry and (9) temperature. For instance, in the length category you can convert millimeters to inches, centimeters to inches, decimeters to inches, meters to feet, decimeters to feet, hectometers to feet, kilometers to miles, inches to millimeters, feet to meters, yards to meters, rods to meters, furlongs to meters and miles to kilometers. In each of the categories you have multiple conversion factors. For instance, did you know that 12 furlongs are equal to 2,414.0208 meters? This is an ideal tool for engineers, high school and college students.

To run the program you merely select the category first from a display of the categories. You will then receive a display of the functions within the categories. You then make a selection of which of the functions you wish to use and the computer will prompt you, for instance, asking how many furlongs. When you enter your number it will then give you the corresponding conversion.

BARTENDER

While we realize that you computer owners would not dream of consuming alcoholic beverages in the presence of your computer, we felt that some of your guests at parties would appreciate seeing the computer used for a truly useful function, such as, a cocktail recipe

holder. Twenty-eight recipe titles are provided on a single screen display. All you do is select which one you want and it will show you the recipe. Everything from an Alexander to a TBS Daytimer...take your pick, but please not in excess.

PERPETUAL CALENDAR

Using a formatted screen this program allows you to enter the month and the year of your choice and it will fill out the calendar for that month. Did you ever want to know what the month you were born in look like? Now is your chance. Enter a two digit month number (do not hit enter) for instance, enter 01 for January, then enter the year you desire.

NUMBER CONVERSION

The Number Conversion program which is one of the extras in the Library 100 allows you to enter any number up to 999,999 and the program will return the number in whatever base you choose up to base 32.

GAMES

JUMBLE

This program gives you ten problems with words jumbled. The letters will not be in the right sequence. It is your task to unjumble the words. In some rare cases two words may be made from the same group of letters. There is, however, only one correct answer. At the end of the program you will be given your score.

SEARCH

Search is a program designed to show you the number crunching capability of the TRS-80. The program will display random numbers between 1 and 300. Each time it creates a random number it will check it against the number 150. When it finds 150 it will then do a statistical analysis of the search to that point. The analysis is done in double precision. It is interesting to let the computer run for 24 hours or so and watch the results. You will be surprised how guests are awed with this program.

MEMORY QUIZ LETTERS

This program is designed to provide entertainment while improving your memory. The program will display seven random letters. Depending on your level, it will display them for a short period of time or a long period of time. Also dependent on your level, after the letters disappear there will be a wait period before you are asked to enter the numbers you saw previously. This game may be an ego deflater at first, but watch your memory improve as you play the game.

STING RAY

In the game Sting Ray you are the commander of the Sol ship Sting Ray, a tactical fighter spacecraft. The Sting Ray is armed with a null beam lance focused 30 miles forward of the ship. If you are able to place the enemy ship at the focal point, you will destroy it. Your enemy is the Jamand Socialist Federation Galaxy. You are on a surprise raid warping through their galaxy. Your mission is to destroy as many Jamand craft as possible. If a Jamand craft is able to start its Satar drive, it will disappear and get away. To control your vessel you use the keys J for left, K for right, U for up, and M for down. At any time you can return for instructions by pressing the space bar. It is important that you learn the keys J for left, K for right, U for up, and M for down. These keys will be used in all of the action graphics programs. They are designed to allow a person to make

right-handed entries and quickly control the action games. In some of the other games, the space bar will be used to halt movement. Once again, remember to use J for left, K for right, U for up, and M for down. In this program the keys must be pressed repeatedly in order to position the null beam at the enemy vessel's location.

RUSSIAN ROULETTE

Russian Roulette is an old game with disastrous consequences if played using the correct instruments. This program, however, gives you the excitement of the game without the injurious consequences.

In this program you are holding a revolver with one chamber loaded. After each "firing" the chamber is spun. You hope you can spin the chamber and fire six times without having the bullet detonate.

WHEEL OF FORTUNE

Around and around she goes, where she stops nobody knows. Now is your chance to experience the thrills of the Wheel of Fortune in a computerized mode. The computer allows you to bet on both numbers and colors. After you place your bets, the computer will display the numbers and the associated colors. The Wheel of Fortune can be played by up to ten players. The Computer will keep track of winnings and losses of each of the players and the house.

TOWERS

Towers is an ancient Oriental game. It allows you to move disks from one peg to another peg. The task is to move all of the disks from the center peg to either the right or the left peg. To do this, you are not allowed to place a large disk on top of a smaller disk. It looks simple but it's more challenging than you would imagine.

DECISION

In the past you made complex decisions using such unsophisticated means as flipping coins, throwing darts, drawing lots, and other boring and uncouth methods. Now you can use the powerful complexity of your full-blown computer system in order to achieve the same certain results. Merely enter your yes or no question. The computer, after proper contemplation, will analyze the question and give you your answer.

MEMORY QUIZ NUMBERS

Like Memory Quiz Letters, the program is a game designed both to entertain you and to improve your memory.

Seven random numbers will be displayed on the screen, and (depending on your level) they will stay on the screen for varying periods of time. After a proper wait the computer will ask you to repeat the numbers you have just seen. At first it may deflate your ego, but you will watch your memory improve.

DOOMSDAY

Who said the TRS-80 couldn't do action graphics? We believe Doomsday will become a TRS-80 classic. You are a commander of a Y Wing interceptor battle cruiser. The Jamand Socialist Federation has launched a Doomsday Satelite to destroy the Sol Federation. As the last remaining battle cruiser, your mission is to give one final shot at destroying the Doomsday satelite. To do this you must pass through the Doomsday satelite's landing corridor and fire a high power limited range meson beam into the hanger entry hatch.

As you approach the landing corridor, you will observe obstacles which have been place in your path. These obstacles have been mined. Your battle cruiser has limited shielding but absorbs some hits (how many depend on your level). At the end of the corridor some undetectable mines are in place. As you approach the end of the corridor, the battle cruiser controls will become sluggish and the ship will slow down. This is due to the automatic activation of the meson beam's final charging mechanism. The meson beam will not fire until you are fully charged. You may, therefore, find it necessary to press the firing button repeatedly. The computer will override if you delay too long in firing. The controls are: J, which moves the ship to the left; K, which moves the ship to the right. The space bar which stabilizes the ship using those controls you should attempt to avoid the obstacles within the corridor. At the end of the tunnel when you are in place to fire, press the Z button. You may have to do this repeatedly in order to fire your meson beam. Good luck. The Galaxy depends on you!

STAR TREK

Welcome to the galaxy of Star Trek! Arising in the dim antiquity of the of the electronic computer age (late 1960's) Star Trek is resident in some form on most mainframe computers and probably every college computer. The game has been written and rewritten many times, and will probably be written many more times as home computers become more popular.

The TBS Star Trek has been written especially for The Bottom Shelf, and your 16K TRS-80, and has several

features not common to most Star Treks. To our knowledge, no other Star Trek allows you a full scale look at the galaxy map at all times, and we believe this to be the first "real time" Star Trek, requiring commands to be entered quickly. Now, let's take a look at it!

Load the program, type "run", wait two seconds for the screen to appear, and freeze the screen by typing a Shift @. (Everyplace else in this program the Shift @ is cheating.)

The galaxy map appears on the top four lines of the screen (which you now see as X's). The Star Trek galaxy is an 8 x 8 grid, the top portion of which appears on the left side of your screen and the bottom portion of the right side of the screen. The galaxy map is read in quadrants, being quadrants over and then quadrants down, so that the quadrant depicted at the upper left corner is quadrant 1-1, and the one just to the right of that is quadrant 2-1. As you play, use the "scan" command. Then portions of the galaxy will change from X's to numbers. Of the three numbers in each quadrant report, the left number represents the number of stars in that quadrant, the middle number the number of star bases, and the right hand number the number of Klingons. Thus you have a record of where the Klingons are.

On the right hand side of the screen is a list of information. Stardate initializes at the beginning of the game. You have thirty stardates in which to kill all Klingons in the galaxy and return to a starbase. Condition is either green or red, and will be red if there is a Klingon present in your quadrant. Energy begins at 10,000 and decreases as you play the game. Running out of energy in the middle of the game is considered bad form, and causes a loss of the game. Shields protect against Klingon phaser blasts and must be kept up. Loss of shields will cause a loss of your phaser, and other odd damage depending on circumstances. Torpedoes you begin with 15 torpedoes which you may use until they are gone, and may reload torpedoes at any starbase. Klingons are the enemy, represented by a "K" on the quadrant display and must be destroyed. The number of Klingons changes for each game. Each Klingon must be destroyed to win the game. Each command must be made within a Time Count of 100 which is displayed in this location. Not inputting a command at this point costs you a Stardate, and the Stardates left (SD left) are displayed at the lower right of the screen and are an absolute measure of the Stardates left in which to complete the game.

On the left side of the screen, the previous course chosen is displayed, along with the quadrant in which you are located and the sector in which the Enterprise is located. The sector screen (the screen in the middle of your screen) is read the same way as the galaxy map from left to right then from top to bottom. The damage report has three elements, each element of which is measured as a reduction in the effectiveness of either the warp, impulse, or phaser. This reduction must be taken into account when setting levels for these commands. The drive used is either warp or impulse. The warp drive is expensive in terms of energy, but cheap in terms of stardate, and must be used for at least an eight sector move. The impulse drive is expensive in terms of stardate, and cheap in terms of energy. On the lower portion of the screen is the word "computer:" where the ship's computer will prompt the next command necessary. Your screen should now read "type go to initialize", and to begin the game the letters "GO" should be entered where they will appear next the word command:" at the lower right of the screen. This is where all entries from the keyboard will appear. The last line of the screen is reserved for miscellaneous comments, some of which will be clear and some not, communications from the crew, and other oddities best left for you to discover.

Next the sector screen appearing in the center of your screen is a computer representation of the command screen as viewed by the captain of the ship, as the entire screen is a view of his entire console complete with readouts. On this sector screen will appear stars, which are asterisks, star bases which are exclamation points, Klingons, which are K's, and the Enterprise, which is an E. Also appearing on this screen will be Torpedoes as they are fired in salvos of five, and the phaser energy report as viewed by the Enterprise's sensors. As a torpedo explodes, or a Klingon is killed, a particular sector becomes highly radioactive and dangerous for a short period, and the Enterprise may not enter that sector; it is then marked with (+), and the computer will not allow that sector to be entered until the radiation has decayed sufficiently. The game is played using six primary commands, which must be memorized. These commands are: "MOVE", "TORP", "PHASER", "SHIELDS", "SCAN", and "DOCK". Each of the commands initializes an entire set of moves on the part of the crew, and prompts for subcommands will appear on the screen. Moves are made by inserting a compass rose value, that is degrees from 0 to 360, measured clockwise, and the range measured in sectors, one sector being the vertical or horizontal distance between dots on the sector screen. A choice must be made between warp or impulse power and thereafter the move is automatic. To fire a TORP, the sector at which the torp should be aimed must be given to the ship's

computer, and the routine is automatic following this. Torps are fired in salvos of five to ensure the destruction of anything at that location. The PHASER must be fed a certain amount of energy. To kill a Klingon immediately adjacent in a horizontal or vertical direction to the Enterprise requires 200 units of energy, the phaser power declining at a geometric rate beyond that point.

If your phaser does not kill all Klingons in the quadrant, the Klingons will return fire, and damage your shields (probably, they can also do other damage on occasion). The SHIELDS command dumps any energy remaining in the shields back to the energy banks, whereupon you must specify the amount to be removed from the energy banks and placed into the shields.

The SCAN command turns on the short-range scan of the ship and fills in the galaxy map for the quadrant in which you are located, and each one adjacent or touching that quadrant. This command requires no further input. To DOCK the Enterprise it must first be placed next to a starbase, energy must be removed from shields, and then the word "DOCK" entered as a command. The procedure following that is automatic as all ammunition and energy is refilled.

Various strategies are useful in completing the game successfully, these strategies being best discovered by yourself as you play.

Now, type "go" and begin!

SKETCH

This game was designed to let you draw on the TRS-80 screen. We have heard of other programs which let you draw on the screen, but not this way. Now you are allowed to draw in either letters, words, or graphic characters. It is best to have a graphic sheet at hand so that you can find the position on the screen where you wish to draw. Like the other games, Sketch uses controls: J for left, K for right, U for up, M for down. The letter I is used for instructions. If you are in the automatic movement mode, the space bar is used to stop movement. You are first asked which character you wish to draw with. This is an important question. You may use any of the alpha or numeric characters with the exception of the "," or ";". This includes spaces, questions, numbers, exclamation points, etc. You may also use words. For instance you may enter your name. It is best to start with a space, then enter each letter or word, then another space. This allows you to print independent characters or words, and they will not show up right next to each other. At this time, you may also enter a Shift Z." This will

allow you access later to the graphics characters. You may also enter a Shift D if you have already completed a drawing. This will allow you to display your drawing in a very unusual format. The drawing will be redrawn in an identical manner to the way you first drew it. It will then pause, clear the screen, and redraw your drawing.

Once you have made your entry to the line, enter the character you wish to draw with. You will be asked to enter the graphic location where you want to start, from the positions 3 to 1,020. Check the graphics work sheet from the back of your level 2 manual in order to locate the position where you want to start. You will then be asked whether you want manual or automatic character movement. If you enter 1 for manual entry, the character you chose to work with will be drawn only once for each time you press the U, J, K, or M button. If you choose automatic character movement, the character or word that you chose will be drawn repeatedly in the direction you choose. If you have chosen graphic display in the first entry, the machine will now display a graphic work sheet. It will show you various arrangements of pixels with a number located to the left of the graphics character. You will then be asked for a graphics character number. The graphics character number chosen will be the one that you work with until you return and ask for another graphic character. It is important to use the "I" button. This will return you to the input mode, where it will ask you again to enter the character you wish to draw with. You may then change from graphics, a word or words, a graphics character or a letter. If you wish to continue with the same character, simply press enter. It will then ask you at which graphic location you wish to start. You can then change the location and start drawing at another section of the screen. It will once again ask you whether you wish to draw with manual or automatic character movement. You have the option to change your mind again. If you don't wish to change, merely press enter. When you press enter again your previous drawing will be redrawn and you will be ready to continue drawing, using the changes that you have made. When you are ready to display your material, press "I" then enter the character Shift D, press enter twice and you will be in the display mode.

FLIPPER

This program allows you to flip coins in mass quantity. After you have chosen the number of coins that you wish to flip, you may use two different display modes to represent the flips. In one Mode "T's" and "H's" are used to represent the flips. They proceed across the screen filling up lines until the number you chose is reached. In the other mode, heads and tails are spelled out along with the flip number. At the end of each mode you will receive a statistical analysis of the

flipping.

LIFE

This program implements The Game of Life, created by John Conway and described by Martin Gardner in Scientific American. The original idea was based on the growth and decay of a colony of bacterial cells, but the underlying forces can be found in any group of living organisms (including man!).

The playing field is a 40 x 40 grid, each square of which can contain a live cell. The patterns of cells change with each generation according to fixed rules. If a live cell has two or three living neighbors (in the eight immediately adjacent squares), it survives to the next generation; otherwise it dies of either isolation or over-crowding. If an empty square has exactly three neighbors, a new cell is born.

The initial pattern of cells is entered from the keyboard. To specify a square, key in its position in the form XXYY (i.e. two digits for the horizontal location and two digits for the vertical). To specify a square adjacent to one just entered, you may use the appropriate arrow key rather than typing the coordinates. The ENTER key indicates all cells have been marked and starts the first generation.

FIFTEEN

This program is based on the puzzle of 15 numbered tiles arranged in a square box with one empty space. Starting with the numbers in sequence, left to right and top to bottom, the object is to form a new pattern by sliding the tiles one at a time. Possible goals include all odd numbers at the top and even at the bottom, numeric order arranged in a spiral, or the reverse of the starting pattern. For a real challenge, try to form the same sequence as the original pattern, but with the space at the top left (this should be impossible, but ...).

To move a tile, type its number followed by an arrow indicating the direction you wish it to move (the ENTER key is not needed). The CLEAR key will restore the original pattern.